

रोल नं.

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Roll No.

परीक्षार्थी कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें ।

Candidates must write the Code on the title page of the answer-book.

- कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 8 हैं ।
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए कोड नम्बर को छात्र उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें ।
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में 26 प्रश्न हैं ।
- कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, प्रश्न का क्रमांक अवश्य लिखें ।
- इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है । प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जायेगा । 10.15 बजे से 10.30 बजे तक छात्र केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे ।
- Please check that this question paper contains 8 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 26 questions.
- **Please write down the Serial Number of the question before attempting it.**
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

## जीव विज्ञान (सैद्धांतिक)

### BIOLOGY (Theory)

निर्धारित समय : 3 घंटे ]

[ अधिकतम अंक : 70

Time allowed : 3 hours ]

[ Maximum Marks : 70

सामान्य निर्देश :

- (i) प्रश्न-पत्र में पाँच खण्डों में 26 प्रश्न दिए गए हैं । सभी प्रश्न अनिवार्य हैं ।
- (ii) खण्ड – क में प्रश्न संख्या 1 से 5 अति लघुत्तर प्रश्न हैं । प्रत्येक प्रश्न एक अंक का है ।
- (iii) खण्ड – ख में प्रश्न संख्या 6 से 10 लघुत्तर प्रश्न I प्रकार के हैं । प्रत्येक प्रश्न दो अंक का है ।
- (iv) खण्ड – ग में प्रश्न संख्या 11 से 22 लघुत्तर प्रश्न II प्रकार के हैं । प्रत्येक प्रश्न तीन अंक का है ।
- (v) खण्ड – घ में प्रश्न संख्या 23 मूल्याधारित प्रश्न चार अंकों का है ।
- (vi) खण्ड – ङ में प्रश्न संख्या 24 से 26 दीर्घ उत्तर प्रश्न हैं, प्रत्येक प्रश्न पाँच अंक का है ।
- (vii) प्रश्न-पत्र में कोई समग्र पर विकल्प नहीं है, फिर भी दो अंक के एक प्रश्न, तीन अंक के एक प्रश्न और पाँच अंकों के तीन प्रश्नों के भीतरी विकल्प दिए गए हैं । प्रत्येक परीक्षार्थी को ऐसे प्रश्नों के दो विकल्पों में से एक प्रश्न हल करना है ।

**General Instructions :**

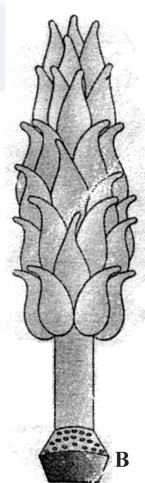
- (i) There are a total of **26** questions and **five** sections in the question paper. **All** questions are compulsory.
- (ii) Section **A** contains question number **1** to **5**, Very Short Answer type questions of **one** mark each.
- (iii) Section **B** contains question number **6** to **10**, Short Answer type **I** questions of **two** marks each.
- (iv) Section **C** contains question number **11** to **22**, Short Answer type **II** questions of **three** marks each.
- (v) Section **D** contains question number **23**, Value Based Question of **four** marks.
- (vi) Section **E** contains question number **24** to **26**, Long Answer type questions of **five** marks each.
- (vii) There is no overall choice in the question paper, however, an internal choice is provided in **one** question of **two** marks, **one** question of **three** marks and all **three** questions of **five** marks. An examinee is to attempt any **one** of the questions out of the **two** given in the question paper with the same question number.

**खण्ड – क**

**SECTION – A**

1. न्यूक्लियोसोम के ऋणात्मक तथा धनात्मक रूप से आवेशित संघटकों के नाम बताइए । **1**  
Name the negatively charged and positively charged components of a nucleosome.
2. बार्नेकलों और ह्वेल के बीच पाए जाने वाली पारस्परिक क्रिया के प्रकार का नाम बताइए । **1**  
Name the type of interaction that exists between barnacles and whale.

3.



यहाँ दिए गए दो चित्रों में पैपेवर (A) और माइकेलिया (B) के पुष्पों के जायांग (स्त्रीकेसर) दर्शाए गए हैं । इनके अंडाशयों की संरचना में अंतर बताइए । **1**



These pictures show the gynaecium of (A) Papaver and (B) Michellia flowers. Write the difference in the structure of their ovaries.

4. बताइए कि साइटोकाइन अवरोध किस प्रकार वायरसी संक्रमण से बचाव करते हैं । 1  
How do cytokine barriers help in evading viral injections ?

5. टर्नर सिंड्रोम के क्रोमोसोमीय विकार क्या हैं ? बताइए । 1  
State the chromosomal defect in individuals with Turner's syndrome.

#### खण्ड - ख

#### SECTION - B

6. E-coRI क्या है ? बताइए कि EcoRI किस प्रकार एक्सोन्यूक्लिएज़ से भिन्न होता है । 2  
What is EcoRI ? How does EcoRI differ from an exonuclease ?

7. एक निःसंतान दम्पति 'टेस्ट ट्यूब बेबी' प्रोग्राम के लिए राजी हो गए हैं । गर्भधारण करने के लिए इस पद्धति में अपनाए जाने वाले मूलभूत चरणों की सूची बनाइए ।

#### अथवा

केले को अनिषेकफलनी फल कहा जाता है, जबकि टर्की को अनिषेकजननी कहा जाता है । क्यों ? 2

A childless couple has agreed for a test tube baby programme. List only the basic steps the procedure would involve to conceive the baby.

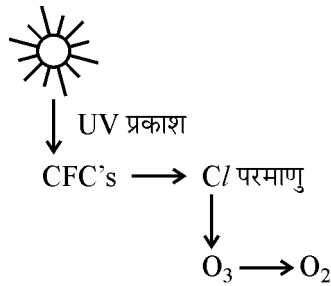
#### OR

Banana fruit is said to be parthenocarpic where as turkey is said to be parthenogenetic. Why ?

8. ठंडे क्षेत्रों में पाए जाने वाले स्तनधारी और ध्रुवीय क्षेत्रों में पाए जाने वाले ध्रुवीय सील अपने शरीर की ऊष्मा के हास को किस प्रकार कम करते हैं ? 2

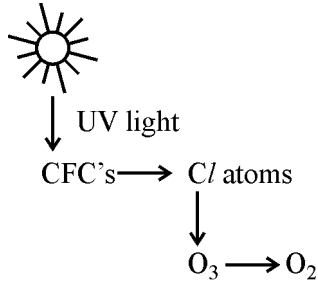
How do mammals living in colder regions and seals living in polar regions able to reduce the loss of their body heat ?

9.



- (a) ओज़ोन के निम्नीकरण के पश्चात् होने वाले दुष्प्रभाव क्या हैं ?  
 (b) इससे मानव स्वास्थ्य पर क्या प्रभाव पड़ता है ?

2



- (a) What are the after effects of the degradation of ozone ?  
 (b) How does it affect human health ?

10. चांस (chance) उत्परिवर्तन क्या होता है ? DDT के अनुप्रयोग का एक उदाहरण के रूप में इस्तेमाल करते हुए इस परिघटना की व्याख्या कीजिए ।

2

What is chance mutation ? Explain this phenomenon using application of DDT as an example.

**खण्ड – ग**

**SECTION – C**

11. बताइए कि HIV के कारण AIDS के पीड़ित व्यक्ति का प्रतिरक्षा-तंत्र किस प्रकार भंग हो जाता है ।

3

How does the HIV breakdown the immune system of the AIDS patient ?

12. (a) बताइए कि मानव शरीर के भीतर उस समय क्या होता है जब मलेरिया के परजीवी ग्रस्त लाल रुधिर कोशिकाओं को फोड़ देते हैं और परजीवी को रुधिर में छोड़ देते हैं ।  
 (b) परपोषी के शरीर के भीतर उन विशिष्ट स्थलों की चर्चा कीजिए जहाँ मलेरिया परजीवी के जीवन-चक्र के दौरान :

- (i) स्पोरोज़ोआइट और  
 (ii) गैमीटोसाइट उत्पन्न होते हैं ।

3

(a) State what happens in the human body when malarial parasites infected RBCs burst to release the parasites in the blood.

(b) Mention the specific sites in the host body where production of

- (i) sporozoites and  
 (ii) gametocytes take place in the life cycle of the malarial parasites.

13. मरुद्भिद् पर्यावास में होने वाले उस पादप-अनुक्रमण की व्याख्या कीजिए जब तक चरमोत्कर्ष समुदाय तक नहीं पहुँच जाता । 3

Explain succession of plants in xerophytic habitat until it reaches climax community.

14. नदी के जल में वाहित मल को छोड़े जाने के कुछ सप्ताह पश्चात् (i) घुलित ऑक्सीजन के स्तर और (ii) अलवण जलीय जीवों की समष्टि के संदर्भ में जल में होने वाले परिवर्तनों की व्याख्या कीजिए । 3

Explain the changes that can be observed in the characteristics of river water when sewage is discharged into it and a few weeks after the discharge with respect to :

- (i) level of dissolved oxygen  
(ii) population of fresh water organisms.
15. गन्ने की एक फसल किसी वायरस से संक्रमित हो गयी है । इससे वायरस मुक्त गन्ना-फसल किस प्रकार विकसित की जा सकती है ? इस प्रणाली की व्याख्या कीजिए । 3

A sugarcane has been affected by virus. How can a virus free cane be developed from it ? Explain the procedure.

16. PCR में Taq पॉलीमरेज़ को क्यों वरीयता दी जाती है ? इस एंज़ाइम के स्रोत की चर्चा कीजिए । 3

Why is Taq polymerase preferred in PCR ? Mention the source of this enzyme.

17. इंग्लैण्ड में श्वेत और काले रंग के शलभों के प्राकृतिक वरण में औद्योगीकरण की क्या भूमिका रही ? 3

**अथवा**

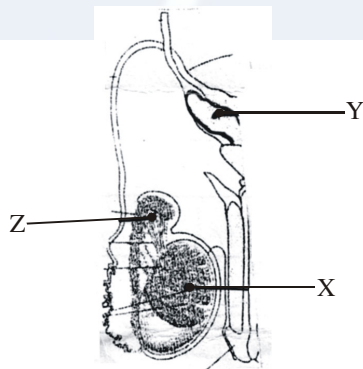
विकास के संदर्भ में उड़न गिलहरी और उड़न फ़ैलेन्जर के बीच समानता का क्या अर्थ समझते हैं ?

How did industrialization play a role in Natural Selection of light and dark coloured moth in England ?

**OR**

What do you infer from the resemblance between flying squirrel and flying phalanger with reference to their evolution.

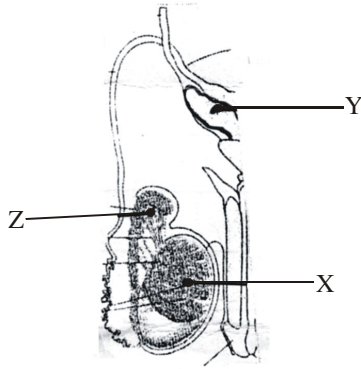
- 18.



उपरोक्त आरेख में मानव का नर जनन-तंत्र (केवल एक तरफ़ का) दर्शाया गया है ।

- (a) 'X' की पहचान कीजिए तथा शरीर के भीतर उसकी स्थिति बताइए ।  
(b) सहायक ग्रंथि 'Y' का नाम बताइए तथा उसके स्राव का नाम भी बताइए ।  
(c) 'Z' का नाम तथा उसका कार्य बताइए ।

**3**



The above diagram shows human male reproductive system (one side only).

- Identify 'X' and write its location in the body.
- Name the accessory gland 'Y' and its secretion.
- Name and state the function of 'Z'.

19. (a) DNA के टेम्प्लेट रज्जुक और कोडिंग रज्जुक में अंतर बताइए ।  
 (b) DNA के प्रतिकृतियन के लिए ऊर्जा के स्रोत का नाम बताइए । 3

- Differentiate between a template strand and coding strand of DNA.
- Name the source of energy for the replication of DNA.

20. किस गुणसूत्र पर वह उत्परिवर्तित जीन विद्यमान होता है जिसके कारण B-थैलैसीमिया नामक रोग हो जाता है ? इस उत्परिवर्तन के कारण क्या-क्या समस्याएँ उत्पन्न हो जाती हैं ? 3

Which chromosome carries the mutated gene causing  $\beta$  thalassaemia ? What are the problems caused by the mutation ?

21. आर्तव चक्र के दौरान निम्नलिखित दिनों में एक सामान्य स्त्री में होने वाली घटनाओं की व्याख्या कीजिए : 3

- 13वें से लेकर 15वें दिन तक अंडाशय के भीतर होने वाली घटना
- 16वें से लेकर 23वें दिन तक अंडाशय के भीतर पाए जाने वाले हॉर्मोनों का स्तर
- 24वें से लेकर 29वें दिन तक गर्भाशय के भीतर होने वाली घटनाएँ

Explain the events in a normal woman during her menstrual cycle on the following days.

- Ovarian event from 13-15 days
- Ovarian hormones level from 16 to 23 days
- Uterine events from 24 to 29 days

22. एक अपरदाहारी किस प्रकार अपघटक से भिन्न होता है ? प्रत्येक का उदाहरण देते हुए व्याख्या कीजिए । 3

How does a detritivore differ from a decomposer ? Explain with an example each.

**खण्ड – घ**

**SECTION – D**

23. एक इक्कीस वर्षीय युवा दुर्घटना में मृत्यु को प्राप्त हो गया । उसके माता-पिता उसके अंगों को दान देने के लिए तत्पर हो गए । उन दो अति आवश्यक चिकित्सकीय चरणों की सूची बनाइए, जो किसी अंग के प्रतिरोपण करने से पहले लिए जाने ज़रूरी होते हैं । कभी-कभी प्रत्यारोपण कुछ मामलों में क्यों अस्वीकृत हो जाता है ? अंग दान को प्रोत्साहित करने के लिए आप अपने स्वास्थ्य-क्लब के सदस्यों के साथ क्या विचार-विमर्श करना चाहेंगे ? **4**

A youth in his twenties met with an accident and succumbed to the injuries. His parents agreed to donate his organs. List any two essential clinical steps to be undertaken before any organ transplant. Why is the transplant rejected sometimes ? What views would you share with your health club members to promote organ donation ?

**खण्ड – ङ**

**SECTION – E**

24. Bt कपास उत्पन्न करने में प्रयुक्त जैवप्रौद्योगिकी के अनुप्रयोग की व्याख्या कीजिए । **5**

**अथवा**

जब तक वेक्टर और DNA-स्रोत को न काटा जाए, अलग हुए खंडों को अलग न किया जाए, तथा जोड़ा न जाए, तब तक वांछित पुनर्योजी वेक्टर अणु को उत्पन्न नहीं किया जा सकता ।

- (a) वांछित DNA क्रमों को किस प्रकार काटा जाता है ?  
(b) काटे गए खंडों को अलग करने की तकनीक की व्याख्या कीजिए ।  
(c) इस प्रकार निर्मित पुनर्योजी वेक्टर DNA अणु से किस प्रकार जुड़ जाते हैं ?

Explain the application of biotechnology in producing Bt cotton.

**OR**

Unless the vector and source DNA are cut, fragments separated and joined, the desired recombinant vector molecule cannot be created.

- (a) How are the desirable DNA sequences cut ?  
(b) Explain the technique used to separate the cut fragments.  
(c) How are the resultant fragments joined to the vector DNA molecule ?

25. (a) एक ऐंजियोस्पर्मि पौधे के माइक्रोस्पॉरेंजियम के काटीय दृश्य का नामांकित आरेख बनाइए ।  
(b) माइक्रोस्पॉरेंजियम में नर गैमीटोफ़ाइट के परिवर्धन की व्याख्या कीजिए ।

**अथवा**

- (a) मानवों में शुक्राणुजनन (Spermatogenesis) को आरंभ करने वाले हॉर्मोन का नाम बताइए । शुक्राणुजनन की प्रक्रिया का क्रमागत वर्णन कीजिए तथा उसके प्रत्येक चरण पर कोशिकाओं की गुणसूत्र संख्या भी बताइए ।  
(b) परिपक्व मानव शुक्राणु का आरेख बनाइए तथा उसके उन भागों का नामांकन कीजिए जो  
(i) उसे अंडाणु तक पहुँचने में मदद करते हैं ।  
(ii) अंडाणु तक पहुँचने के लिए ऊर्जा प्रदान करते हैं ।  
(iii) उसे अंडाणु के भीतर प्रवेश करने में मदद करते हैं । **5**



- (a) Draw a labelled diagram of the sectional view of microsporangium of an angiosperm.
- (b) Explain the development of male gametophyte in the microsporangium.

**OR**

- (a) Name the hormone that initiates spermatogenesis in humans. Describe the process of spermatogenesis in sequence mentioning the ploidy of the cells at each step.
- (b) Draw the diagram of a mature human sperm and label the parts that
- helps it reaching to the ovum.
  - providing energy for it to reach the ovum.
  - helping it to gain entry into the ovum.

26. प्रतिकृति द्विशाख की सहायता से DNA प्रतिकृतीयन की प्रक्रिया की व्याख्या कीजिए ।

**अथवा**

- (a) एक समयुग्मजी लंबे और गोल बीजों वाले तथा एक बौने और झुर्रीदार बीजों वाले उद्यान मटर के पौधों के बीच द्विसंकर संकरण कराया गया ।
- इस संकरण से प्राप्त  $F_1$  संतति के फीनोटाइप और जीनोटाइप के बारे में लिखिए ।
  - $F_1$  संतति द्वारा बनने वाले विभिन्न प्रकार के युग्मक बताइए ।
  - इस संकरण से प्राप्त  $F_2$  पीढ़ी के फीनोटाइपों और उसके अनुपातों की चर्चा कीजिए और साथ ही मेण्डल द्वारा दी गयी व्याख्या भी लिखिए ।
- (b) मॉर्गन द्वारा ड्रोसोफ़िला में किए गए तथा मेंडल द्वारा मटर के पौधों में किए गए द्विसंकर संकरणों के  $F_2$  संतति के प्रेक्षणों में क्या अंतर थे ? कारण बताते हुए व्याख्या कीजिए ।

**5**

Explain the process of DNA replication with the help of a replicating fork.

**OR**

- (a) Dihybrid cross between two garden pea plant one homozygous tall with round seeds and the other dwarf with wrinkled seeds was carried.
- Write the genotype and phenotype of the  $F_1$  progeny obtained from this cross.
  - Give the different types of gametes of the  $F_1$  progeny.
  - Write the phenotypes and its ratios of the  $F_2$  generation obtained in this cross along with the explanation provided by Mendel.
- (b) How were the observations of  $F_2$  progeny of dihybrid crosses in Drosophila by Morgan different from that of Mendel carried in pea plants ? Explain giving reasons.



**Senior School Certificate Examination**  
**COMPARTMENT (2015)**  
**Marking Scheme - Biology (Theory)**  
**Expected Answers/Value Points**

**General Instructions**

***The Marking Scheme and mechanics of marking***

1. In the marking scheme-the marking points are separated by commas, one oblique line (/) indicates acceptable alternative, two obliques (//) indicate complete acceptable alternative set of marking points.
2. Any words/phrases given within brackets do not have marks.
3. Allow spelling mistakes unless the misspelt word has another biological meaning. Ignore plurals unless otherwise stated in the marking scheme.
4. In any question exclusively on diagram no marks on any description. But in questions on descriptions, same value points may be marked on the diagrams as a substitute.
5. All awarded marks are to be written in the left hand margin at the end of the question or its part.
6. Place a tick (✓) in red directly on the key/operative term or idea provided it is in correct context. Place “Half-tick” ½ wherever there is ½ mark in the marking scheme. (Do not place tick indiscriminately just to show that you have read, the-answer).
7. If no marks are awarded to any part or question put a cross (x) at incorrect value portion and mark it zero (in words only).
8. Add up ticks or the half ticks for a part of the question, do the calculation if any, and write the part total or the question total in the left hand margin.
9. Add part totals of the question and write the question total at the end. Count all the ticks for the entire question as a recheck and draw a circle around the question total to confirm correct addition.
10. If parts have been attempted at different places do the totalling at the end of the part attempted last.
11. If any extra part is attempted or any question is reattempted, score out the last one and write “extra”.
12. In questions where only a certain number of items are asked evaluate only that many numbers in sequence as is asked ignoring all the extra ones even if otherwise correct.
13. Transcribe the marks on the cover page. Add up question totals. Recheck the script total by adding up circled marks in the script.
14. Points/answer given in brackets in marking scheme are not so important and may be Ignored for marking.

## Question Paper code 57/1/3

Q nos 1-5 are of one mark each

**Q1 Name the negatively charged and positively charged components of a nucleosome.**

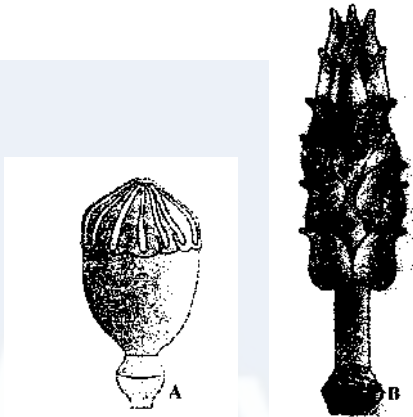
Ans. Negatively charged component DNA , positively charged component histone octamer  $\frac{1}{2} + \frac{1}{2}$

**Q2. Name the type of interaction that exists between barnacles and whale.**

Ans. Commensalism

1

**Q3 . These pictures show the gynoecium of (A) Papaver and (B) Michellia flowers. Write the difference in the structure of their ovaries.**



Ans. a. ( multicarpellary) ovary showing fused/ syncarpous pistil  $\frac{1}{2}$   
b. (multicarpellary) ovary showing free/ apocarpous pistil  $\frac{1}{2}$

**Q4. How do cytokine barriers help in evading viral injections?**

Ans. Virus infected cells secrete proteins called interferons , which protect non-infected cells from further infection  
1

**Q5. State the chromosomal defect in individuals with Turner's syndrome.**

Ans.( In female) Monosomy of sex chromosome // XO condition // Absence of one X chromosome 1

### SECTION – B

Q nos 6-10 are of two marks each

**Q6. What is EcoRI ? How does EcoRI differ from an exonuclease?**

Ans. EcoRI is restriction endonuclease enzyme.

1

Exonuclease removes nucleotides from the ends of DNA while  $\frac{1}{2}$

EcoRI makes cuts at specific position within the DNA  $\frac{1}{2}$

**Q7. A childless couple has agreed for a test tube baby programme. List only the basic steps the procedure would involve to conceive the baby.**

OR

**Banana fruit is said to be parthenocarpic where as turkey is said to be parthenogenetic. Why?**

Ans. Extraction of gametes from the parents/donors.  $\frac{1}{2}$   
Invitro / fertilisation (simulated conditions in laboratory)  $\frac{1}{2}$   
transfer of the zygote / early embryo, (at 8 blastomere stage )into the fallopian tube  $\frac{1}{2} + \frac{1}{2}$

OR

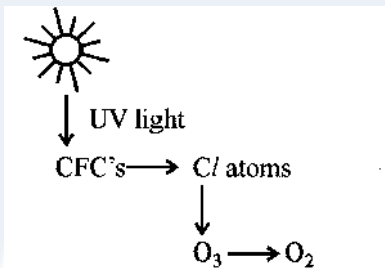
Banana –the fruit develops without fertilisation from an unfertilised ovary. 1  
Turkey- the ovum/ Female gamete develop into a new chick without fertilisation. 1

**Q8. How do mammals living in colder regions and seals living in polar regions able to reduce the loss of their body heat?**

Ans. Mammals from colder climates generally have shorter ears and limbs which minimise heat loss (Allen's rule)

In polar region seals have thick layer of fat (blubber) below their skin that acts as insulator and reduce loss of body heat  $1+1$

**Q9. (a) What are the after effects of the degradation of ozone?  
(b) How does it affect human health?**



Ans. a. Thinning of Ozone/ Ozone depletion /UV-B penetrates Ozone- forms hole- reaches earth. 1

b. UV-B damages DNA causes mutation, ageing of skin/ damage of skin cells/ skin cancer/ inflammation of cornea (snow blindness, cataract ) (any two)  $\frac{1}{2} + \frac{1}{2}$

**Q10. What is chance mutation ? Explain this phenomenon using application of DDT as an example.**

Ans. DDT is an insecticide- kills most of the insect s , but some become resistant varieties, in much less time scale of just months or years , It is a chance event in nature- so chance Mutation  $4 \times \frac{1}{2} = 2$

### SECTION - C

**Q nos 11-22 are of three marks each**

**Q11. How does the HIV breakdown the immune system of the AIDS patient?**

Ans.

- Virus enters in macrophages
- RNA genome replicates to form viral DNA with help of reverse transcriptase,
- Viral DNA gets incorporated into host cells' DNA to produce virus particles,
- HIV enters into helper 'T' lymphocytes and produces progeny virus,
- Which are released in the blood and attack other helper 'T' lymphocytes,
- This leads to progressive decrease number of helper 'T' lymphocytes and the persons starts suffering from infections (loss of immunity)  $\frac{1}{2} \times 6 = 3$

**Q12 (a) State what happens in the human body when malarial parasites infected RBCs burst to release the parasites in the blood.**

**(b) Mention the specific sites in the host body where production of**

**(i) sporozoites and**

**(ii) gametocytes take place in the life cycle of the malarial parasites.**

Ans. (a) The rupture of RBCs results in releasing toxic substance haemozoin, which is responsible for chill and high fever (3-4 days) 1

(b) (i) intestine of mosquito  $\frac{1}{2}$   
 (ii) RBCs of human  $\frac{1}{2}$

**Q13. Explain succession of plants in xerophytic habitat until it reaches climax community.**

Ans. Lichens on bare rock, acids to dissolve rock ( weathering of soil), Bryophytes to hold soil water, grass, small plants / shrubs, trees- forest (Climax community)  $\frac{1}{2} \times 6 = 3$

**Q14. Explain the changes that can be observed in the characteristics of river water when**

**sewage is discharged into it and a few weeks after the discharge with respect to:**

**(i) level of dissolved oxygen**

**(ii) population of fresh water organisms.**

Criteria/Time of Sewage discharged	When Sewage is discharged	Few weeks after discharge
Level of dissolved oxygen	Microorganisms involved in biodegradation of organic matter consume a lot of oxygen, resulting in sharp decline in dissolved oxygen <span style="float: right;"><math>\frac{1}{2} + \frac{1}{2}</math></span>	Level of dissolved oxygen increases as sewage decreases <span style="float: right;"><math>\frac{1}{2} + \frac{1}{2}</math></span>
Population of fresh water organisms	decline in dissolved oxygen causes mortality of fresh water organisms <span style="float: right;"><math>\frac{1}{2}</math></span>	Reappearance of population fresh water organisms <span style="float: right;"><math>\frac{1}{2}</math></span>

**Q15. A sugarcane has been affected by virus. How can a virus free cane be developed from it ? Explain the procedure.**

Ans. Tissue culture / micropropagation, 1

Meristem (Apical and axillary) can be removed from the explants, grown in vitro culture with special nutrient medium (with sucrose acids, auxins & cytokinin), under sterile / aseptic condition, plantlets develop as virus free plants  $\frac{1}{2} \times 4 = 2$

**Q16. Why is Taq polymerase preferred in PCR ? Mention the source of this enzyme.**

Ans. Taq polymerase is used for amplification of DNA / gene, (Usually enzymes also get denatured) Taq polymerase remains active at high temperature, Thermus aquaticus (If bacteria written give only  $\frac{1}{2}$ ) 1+1+1=3

**Q17. How did industrialization play a role in Natural Selection of light and dark coloured moth in England?**

**OR**

**What do you infer from the resemblance between flying squirrel and flying phalanger with reference to their evolution.**

Ans. Before industrialisation there were more white winged –moth on trees than dark winged.  $\frac{1}{2}$

- After industrialisation due to industrial smoke and soot, tree trunks became dark,  $\frac{1}{2} + \frac{1}{2}$

- Under this condition the white winged moths did not survive, due to predation  $\frac{1}{2} + \frac{1}{2}$
- And dark coloured moth survive/ able to camouflage to survive  $\frac{1}{2}$

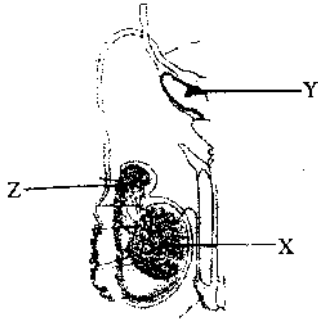
**OR**

Evolution of marsupial mammals has resulted in flying phalanger, through adaptive radiation.  $\frac{1}{2} + \frac{1}{2}$

Evolution of placental mammals has led to the evolution of a flying squirrel (independently) 1

The resemblance between the two, proves convergent evolution.  $\frac{1}{2} + \frac{1}{2}$

**Q18.**



The above diagram shows human male reproductive system (one side only).

- Identify 'X' and write its location in the body.
- Name the accessory gland 'Y' and its secretion.
- Name and state the function of 'Z'.

Ans. (a) X=Testicular lobules, location – Testis// Testis , location outside the abdominal cavity/ scrotum  $\frac{1}{2} + \frac{1}{2}$

(b) Y= Accessory glands , seminal plasma  $\frac{1}{2} + \frac{1}{2}$

(c) Z= epididymis, function: storage of sperms  $\frac{1}{2} + \frac{1}{2}$

**Q19. (a) Differentiate between a template strand and coding strand of DNA.**

**(b) Name the source of energy for the replication of DNA.**

Ans.

Role/Strand	Template strand	Coding strand
function	codes for the protein molecule	Does not code for anything
polarity	$3' \rightarrow 5'$	$5' \rightarrow 3'$

1+1

b. Deoxy nucleoside triphosphates

1

**Q20. Which chromosome carries the mutated gene causing B thalassaemia ? What are the problems caused by the mutation?**

Chromosome number 11 carries the Mutant gene causing B thalassaemia

1

It causes formation of abnormal haemoglobin molecules, resulting into anaemia

1+1

**Q21. Explain the events in a normal woman during her menstrual cycle on the following days.**

**(a) Ovarian event from 13-15 days**

**(b) Ovarian hormones level from 16 to 23 days**

**(c) Uterine events from 24 to 29 days**

Ans. (a) Rupture of Graafian follicle leads to ovulation / release of ovum

(b). Estrogen level is low

(c). Disintegration of endometrium and menstrual cycle begins

1+1+1=3

**Q22. How does a detritivore differ from a decomposer ? Explain with an example each.**

Ans.

	<b>Detritivore</b>	<b>Decomposer</b>
1	feeds on waste dead plant and animal remains including faecal matter.	degrades dead organic matter
2	breaks feeding material into fragments	secretes enzymes into dead organic matter for decomposition
3	Eg. Earth worm	eg- Bacteria/ Fungi

1+1+1=3

**Section D**

**Q no 23 is of four marks**

**Q23. A youth in his twenties met with an accident and succumbed to the injuries. His parents agreed to donate his organs. List any two essential clinical steps to be undertaken before any organ transplant. Why is the transplant rejected sometimes ? What views would you share with your health club members to promote organ donation?**

Ans. Blood group matching, and tissue matching should be done prior to the organ transplant, the body is able to identify the 'non-self' graft, triggers the cell mediated immune response, this rejects the graft

5x 1/2 = 2 1/2

Views-

Cornea can be transplanted to any one and a blind can see the world. Heart / lung/ Kidney can be transplanted and a person is gifted with life, the mind set to volunteer to register for organ donation – (particularly eye donation) ( any other valid views ) (3x 1/2 = 1 1/2)

**Section E**

**Q nos 24-26 are of five marks each**

**Q24. Explain the application of biotechnology in producing Bt cotton.**

**OR**

**Unless the vector and source DNA are cut, fragments separated and joined, the desired recombinant vector molecule cannot be created.**

**(a) How are the desirable DNA sequences cut?**

**(b) Explain the technique used to separate the cut fragments.**

**(c) How are the resultant fragments joined to the vector DNA molecule?**

Ans. Bt toxin gene has been cloned from the bacteria, and has been expressed in plants, to provide resistance to insects (without the need for insecticide), Bt toxin gene forms protein crystals, these crystals contain a toxic insecticidal protein, Bt toxin protein exists as inactive protoxin in the host, but once the insect ingests the inactive toxin, it is converted in active form of toxin, due to alkaline pH of the gut which solubilises the crystals, causing death of the insect.

(10 x 1/2 = 5)

OR

(a) DNA sequences of the vector as well as the source are cut by the same restriction enzyme like EcoRI in a palindromic Sequence  $\frac{1}{2} + \frac{1}{2}$

(The Cut ends overhang as sticky ends in the medium.)

(b) These cut ends fragments are to be extracted from the culture medium using gel electrophoresis.  $\frac{1}{2}$

This has an agarose gel matrix  $\frac{1}{2}$

Fragments are fed in the wells  $\frac{1}{2}$

They are negatively charged  $\frac{1}{2}$

So move towards anode under an electric field through the gel  $\frac{1}{2}$

smaller fragments move faster, thus separated  $\frac{1}{2}$

(c) Fragments are now added to the medium containing the vector DNA  $\frac{1}{2}$

The sticky ends facilitate the action of the enzyme ligase joins the source DNA to the Vector  $\frac{1}{2}$

( 10x  $\frac{1}{2}$  = 5)

**Q25. (a) Draw a labelled diagram of the sectional view of microsporangium of an angiosperm.**

**(b) Explain the development of male gametophyte in the microsporangium.**

OR

**(a) Name the hormone that initiates spermatogenesis in humans. Describe the process of spermatogenesis in sequence mentioning the ploidy of the cells at each step.**

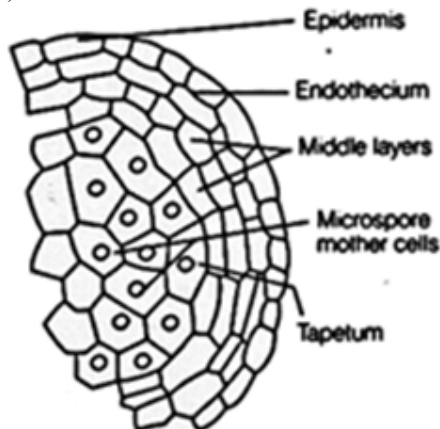
**(b) Draw the diagram of a mature human sperm and label the parts that**

**(i) helps it reaching to the ovum.**

**(ii) providing energy for it to reach the ovum.**

**(iii) helping it to gain entry into the ovum.**

(a)



(five correct labelling  $5 \times \frac{1}{2} = 2\frac{1}{2}$ )

(b) each cell of sporogenous tissue, gives rise to microspore mother cell  $\rightarrow$  meiosis/ microsporogenesis,  $\rightarrow$  microspore Tetrad  $\rightarrow$  4-pollen grains (male gametophyte) 2-celled stage  $5 \times \frac{1}{2} = 2\frac{1}{2}$

OR

(a) Gonadotropin releasing hormone/ GnRH

1

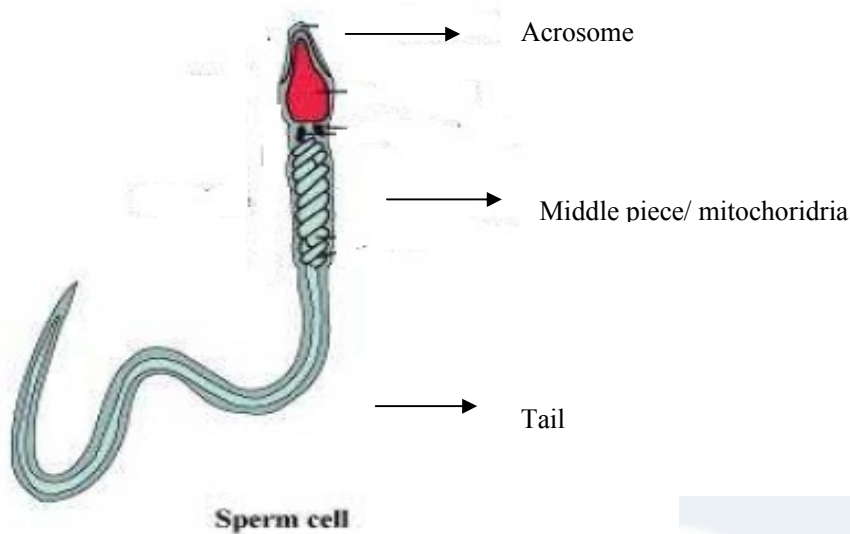
Process of spermatogenesis

- The Spermatogonia (present on inside wall of seminiferous tubules) are diploid (2N)



- (Some of the spermatogonia) primary spermatocytes which undergo I<sup>st</sup> meiosis leading to formation of two equal haploid cells(N) called secondary spermatocyte.
- The secondary spermatocytes under go the second meiotic division to form 4 equal haploid(N) Spermatids.
- Now spermatids transform into spermatozoa (N)// Correct flow chart of spermatogenesis  
 $4 \times \frac{1}{2} = 2$

(b)



Correct diagram-  $\frac{1}{2}$

I.	Tail	$\frac{1}{2}$
II.	Middle piece/ mitochondria	$\frac{1}{2}$
III.	Acrosome	$\frac{1}{2}$

**Q26. Explain the process of DNA replication with the help of a replicating fork.**

**OR**

**(a) Dihybrid cross between two garden pea plant one homozygous tall with round seeds and the other dwarf with wrinkled seeds was carried.**

**(i) Write the genotype and phenotype of the F1 progeny obtained from this cross.**

**(ii) Give the different types of gametes of the F1 progeny.**

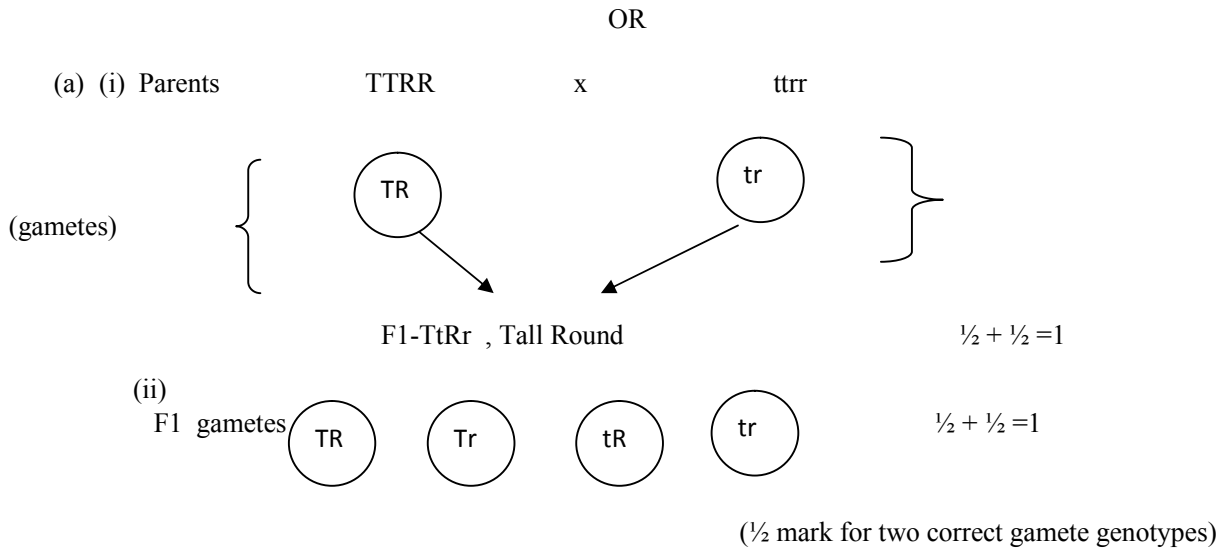
**(iii) Write the phenotypes and its ratios of the F2 generation obtained in this cross along with the explanation provided by Mendel.**

**(b) How were the observations of F2 progeny of dihybrid crosses in Drosophila by Morgan different from that of Mendel carried in pea plants ? Explain giving reasons.**

Ans. There is a definite region in DNA where the replication originates called as origin of replication, For long DNA molecules since the two strands of DNA cannot be separated in its entire length, the replication occurs within a small opening of the DNA helix, referred to as replication fork.

The DNA dependent DNA polymerase, catalyze polymerization only in one direction, that is 5'-->3', on one strand ( the template with polarity 3'-->5') the replication is continuous, while on the other( the template with polarity 5'-->3') it is discontinuous. The discontinuous synthesized fragments are later joined by the enzyme DNA ligase.

(10 x  $\frac{1}{2}$  = 5)



(iii)

Phenotypes	Tall Round : Tall Wrinkled : Dwarf Round : Dwarf Wrinkled	$\frac{1}{2}$
ratio	9 : 3 : 3 : 1	$\frac{1}{2}$

Explanation:- The law of independent assortment states that when two pairs of traits are combined in a hybrid, segregation of one pair of character is independent of the other pair of characters. 1.

(b) Morgan observed the result of linkage of genes on a chromosome, but Mendel did not observe phenomenon of linkage in pea plants // F2 ratio of Morgan deviated significantly from 9:3:3:1 ratio (Mendelian ratio) 1